AmericaView 2016 Update

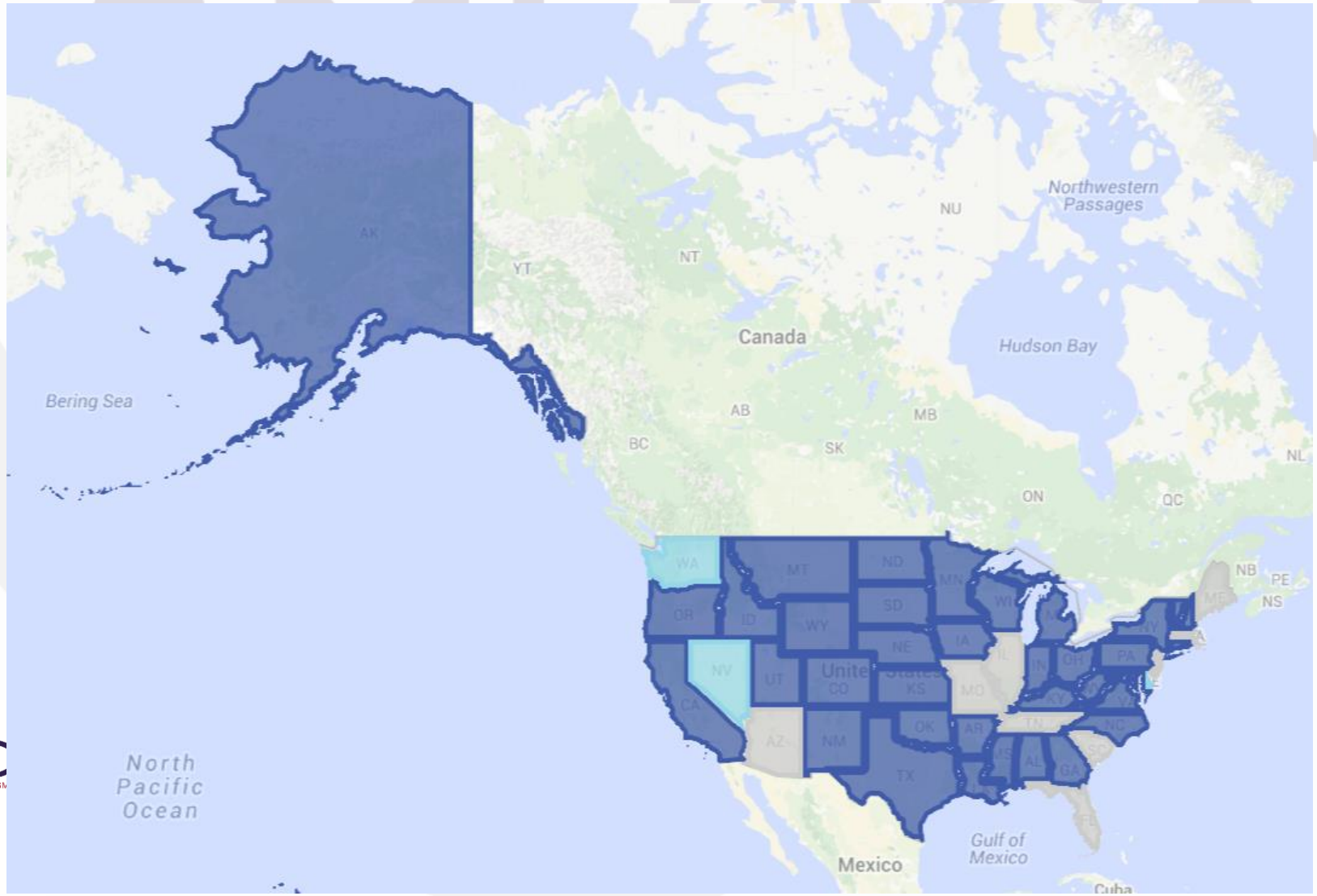
Rick Lawrence, Emma Bode, Shannon Savage – MontanaView
Marv Bauer, Leif Olmanson – MinnesotaView
Doug Ramsey – UtahView
Yong Wang – North CarolinaView

26 July 2016
Landsat Science Team Meeting
Brookings, South Dakota

What is AmericaView

- University-led, state-based consortium
- Dedicated to advancing remote sensing:
  - Data availability and distribution
  - Education
  - Outreach
  - Research and technology transfer
- Funded under the USGS National Land Remote Sensing Education Outreach and Research Activity (NLRSEORA)

Current Membership



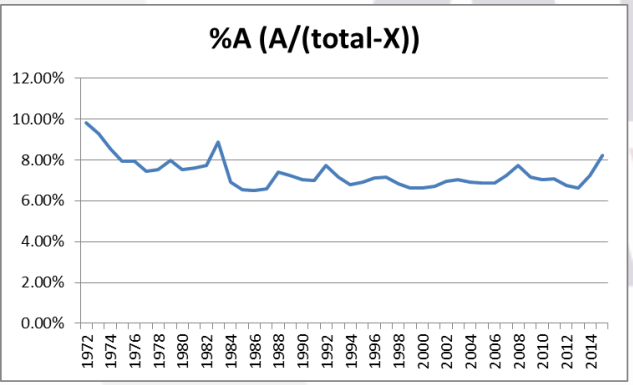
Evaluation of Surface Reflectance Product

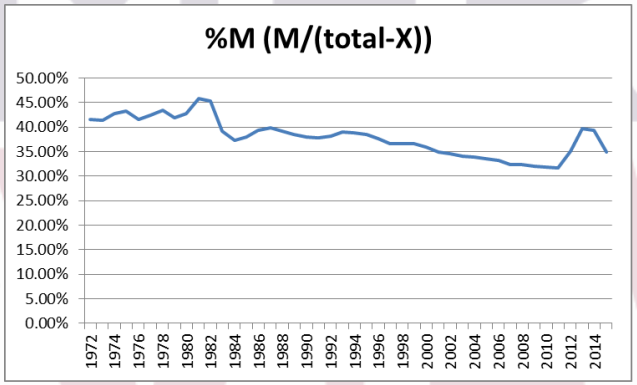
- Models to predict percent mortality from bark beetle
- Developed with 2013 OLI SR data
- Predict 2009 Landsat 5 TM SR data
- Compared pre-7/1/2016 L8SR and post-7/1/2016 LaSRC

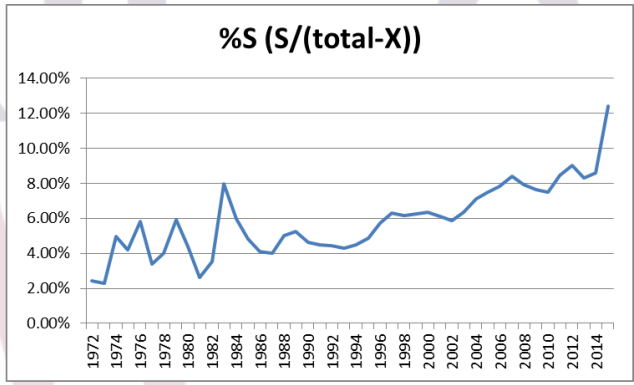
Evaluation of Surface Reflectance Product (cont.)

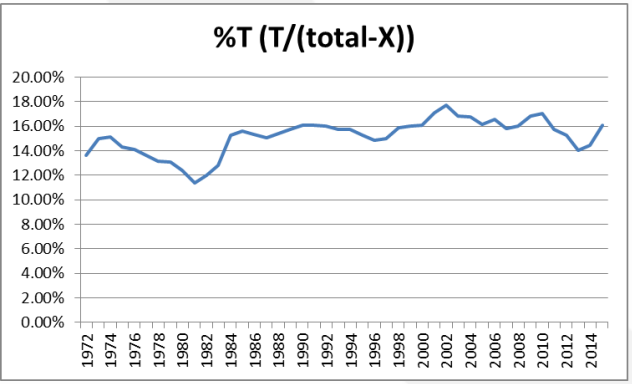
- 2013 base year comparison
  - Median error decreased 41% (from 3.04% to 1.79%)
- 2009 predictions based on 2013 model
  - Median error decreased 58% (from 6.57% to 2.52%)

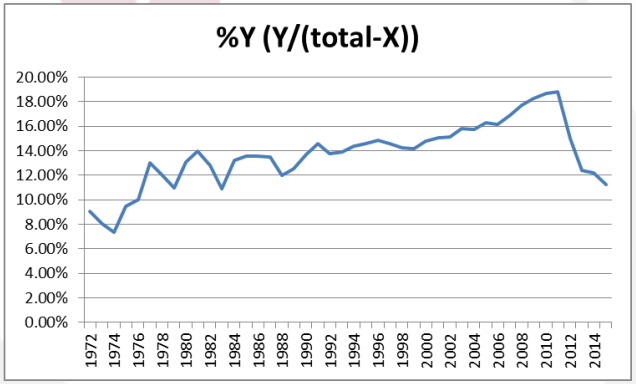
Forest Structure Time Series

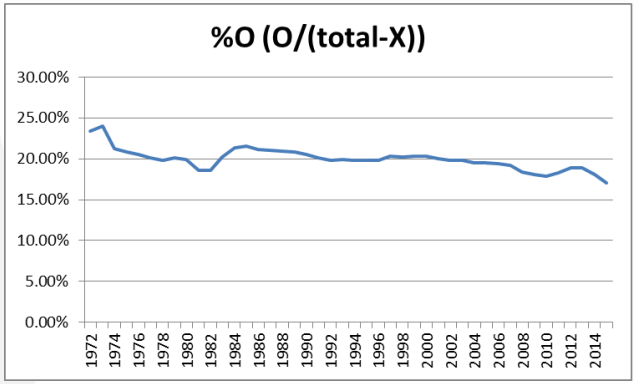












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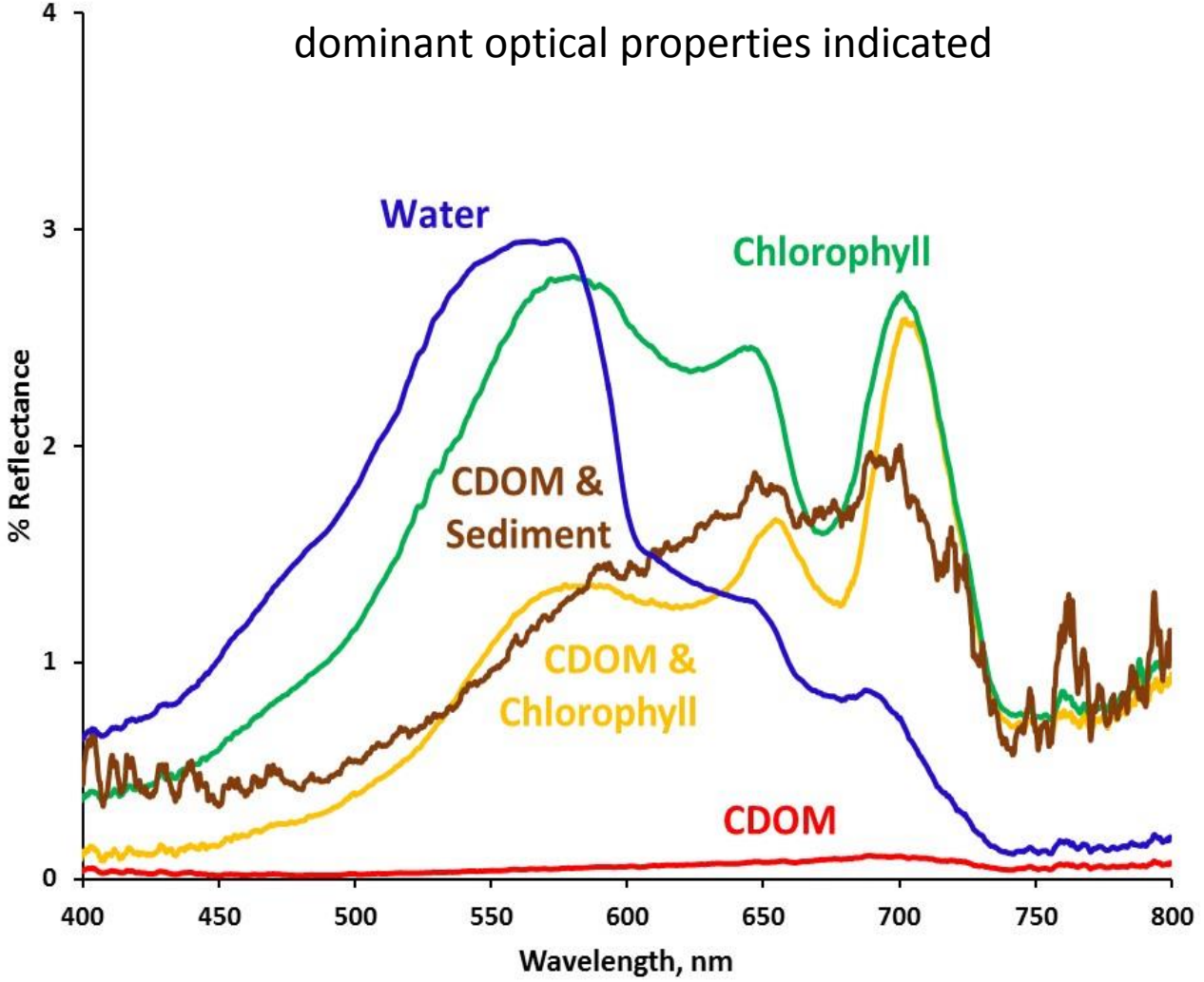
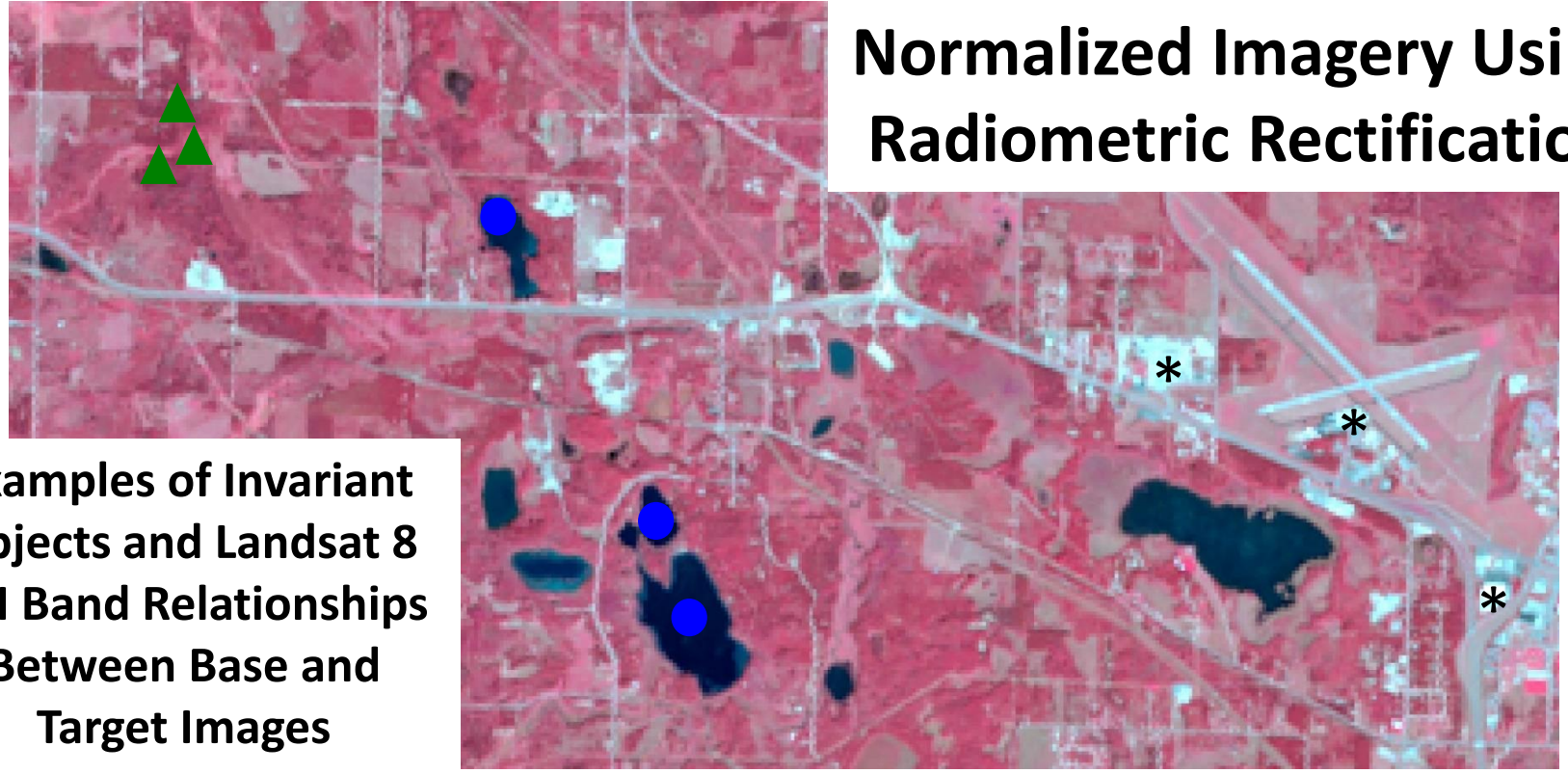
Representative Reflectance Spectra Showing Some of the Optical Complexity of Water Bodies in Minnesota.

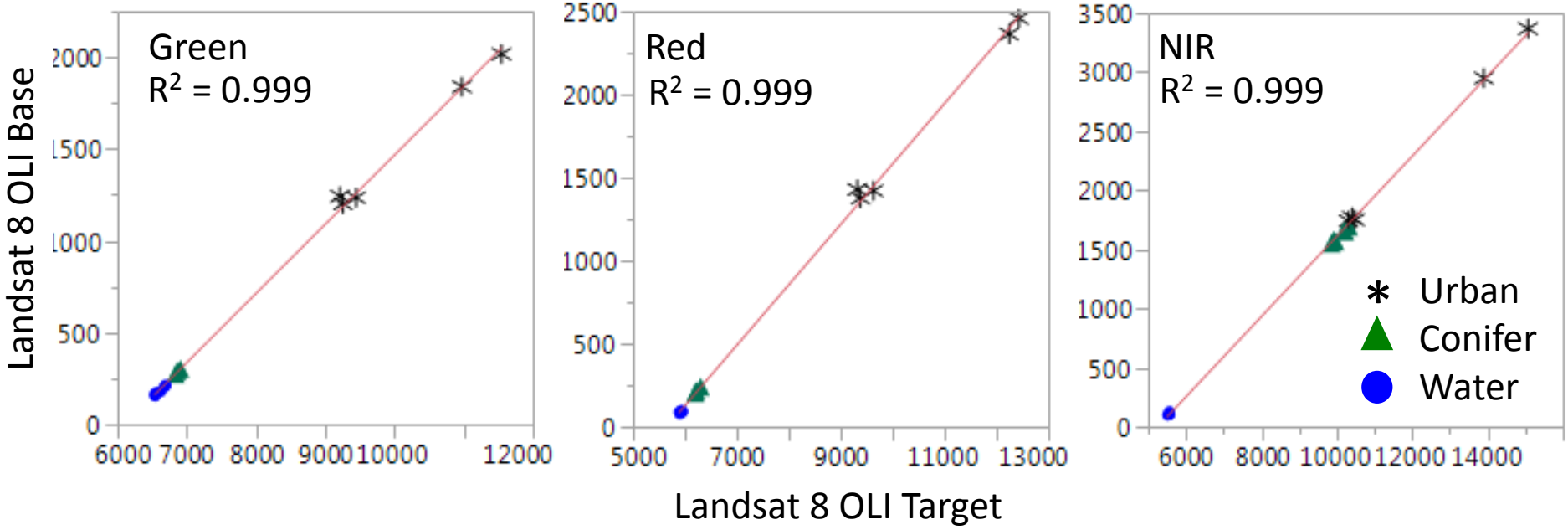
Colored Dissolved Organic Matter (CDOM)



Normalized Imagery Using Radiometric Rectification



Examples of Invariant Objects and Landsat 8 OLI Band Relationships Between Base and Target Images

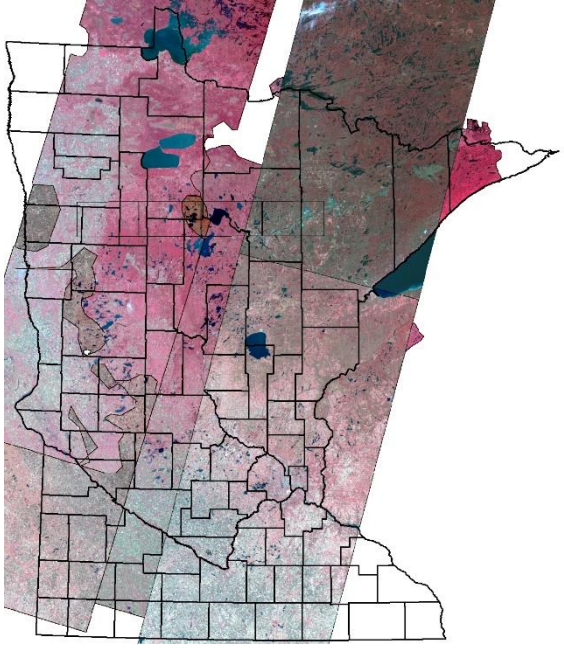


Landsat 8 OLI Imagery Used for Minnesota CDOM Map

Provisional Surface Reflectance v 2.2

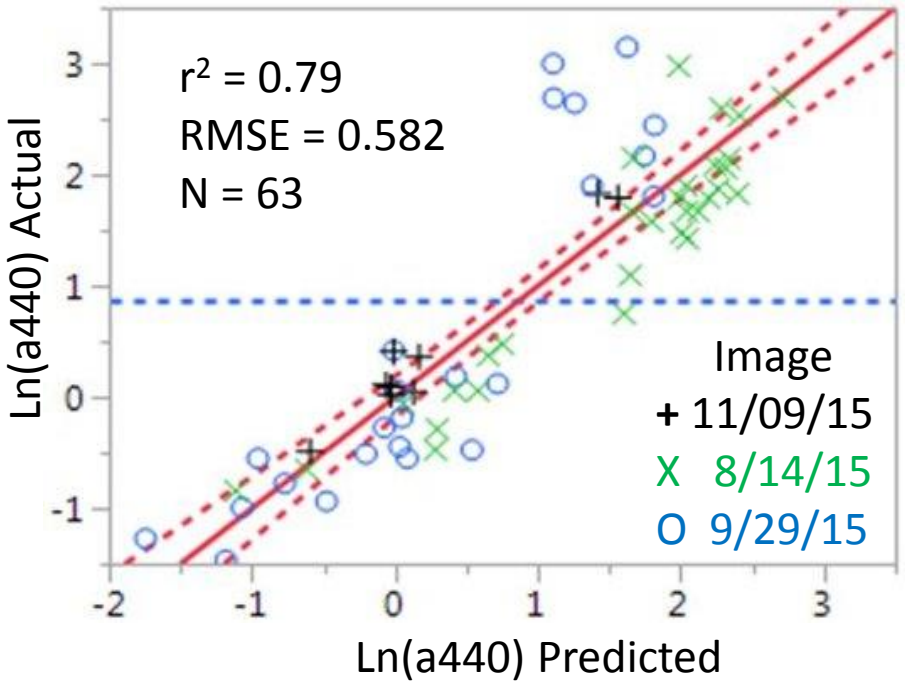
9/20/15 11/7/15 9/29/15 11/9/15

Radiometric Rectification

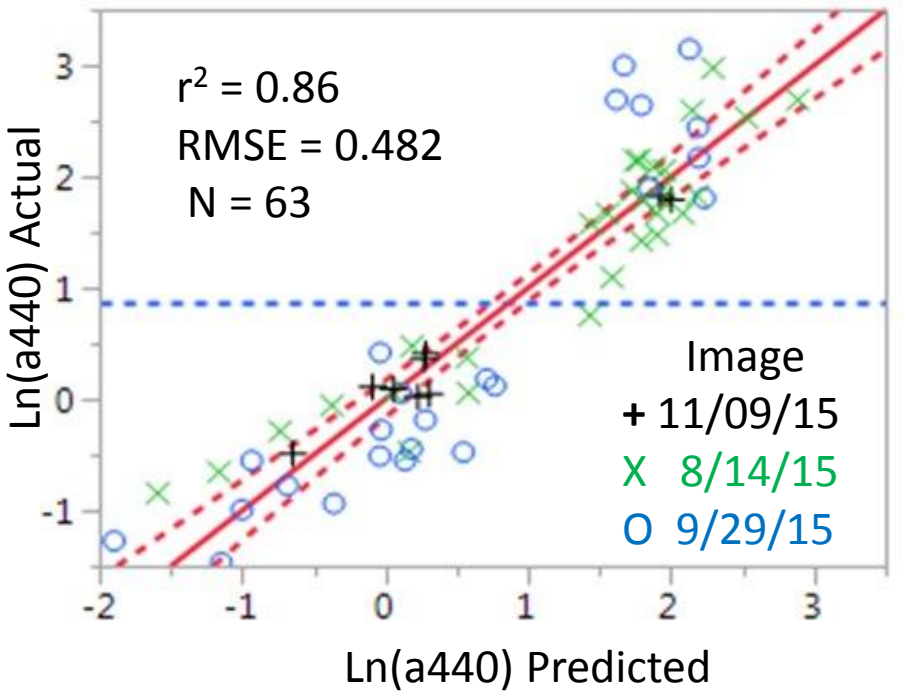


a^{440} in situ vs. a^{440} using Landsat 8 data from multiple dates normalized to surface reflectance using radiometric rectification

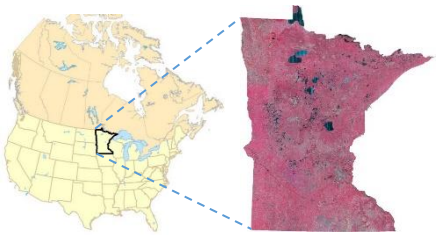
green/red model



green/red + ln(red/NIR)



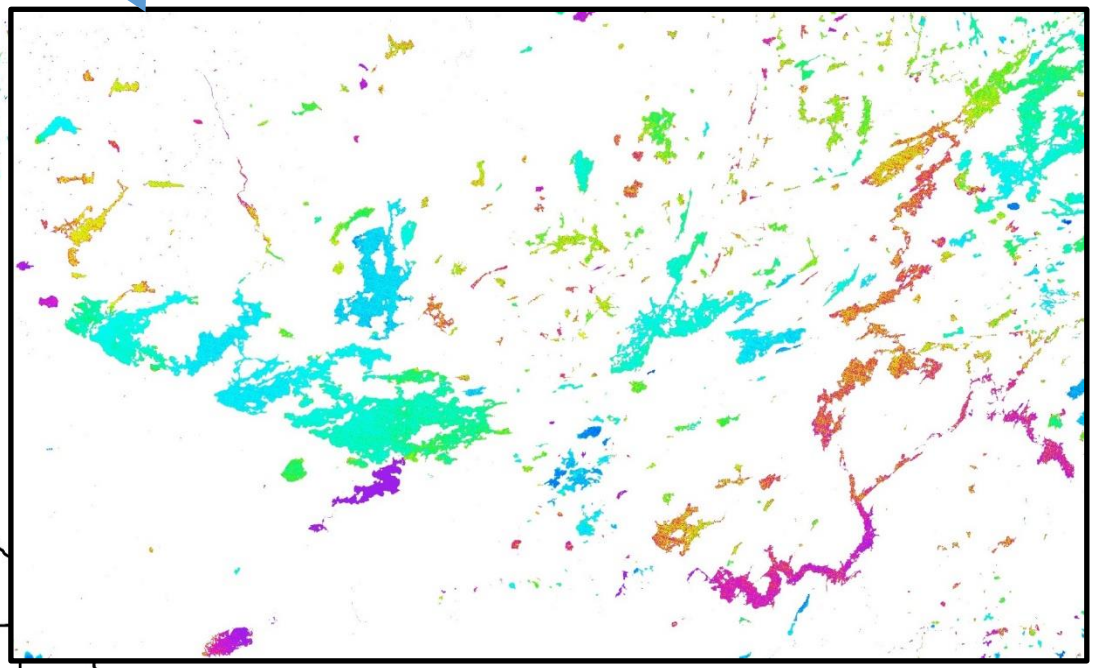
Minnesota CDOM Map



a_{440} (m^{-1})
1
2
4
6
8
10
≥11

N
W
E
S

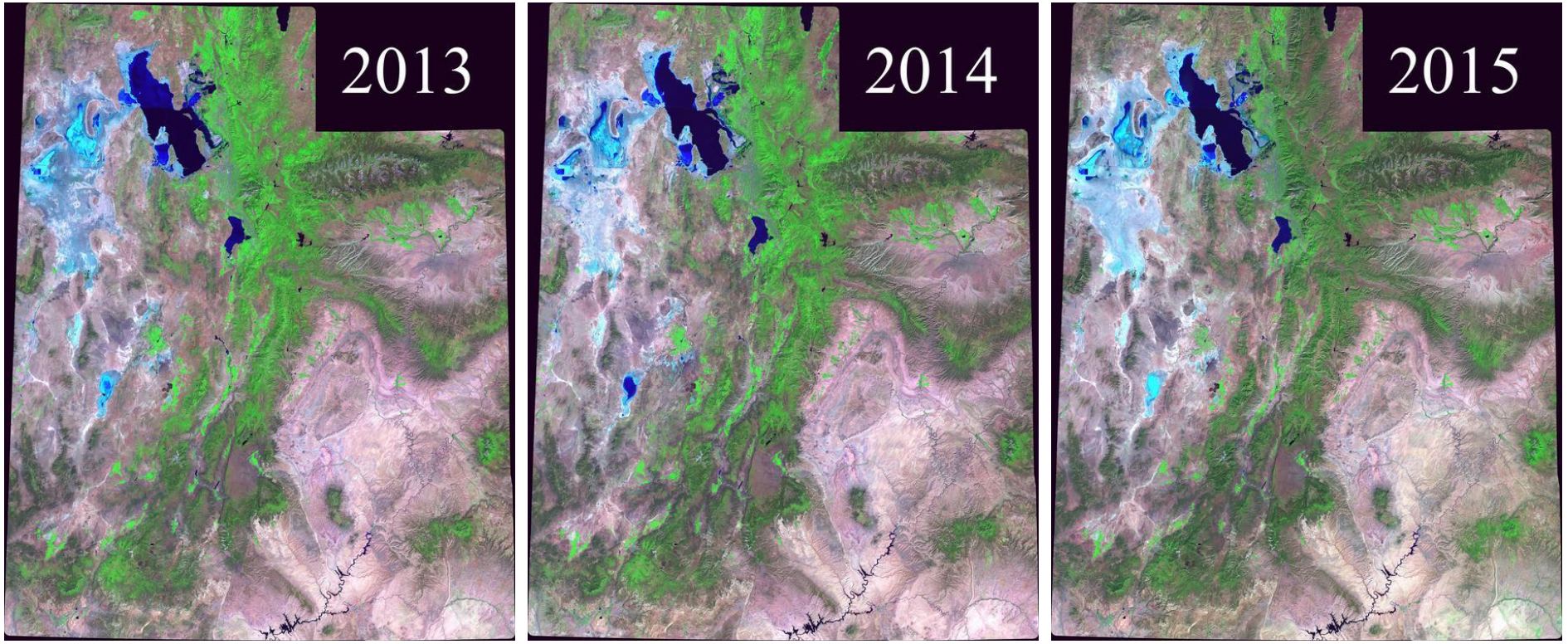
Two-variable model (green/red + ln(red/NIR)),
a_{440} = -5.478*OLI3/OLI4 - 0.633*LN(OLI4/OLI5) + 8.135



Universal Model for Multiple Landsat Images

Kilometers
0 50 100 200 300 400

Landsat OLI Multi-Temporal Normalized Difference Vegetation Index Image Mosaics

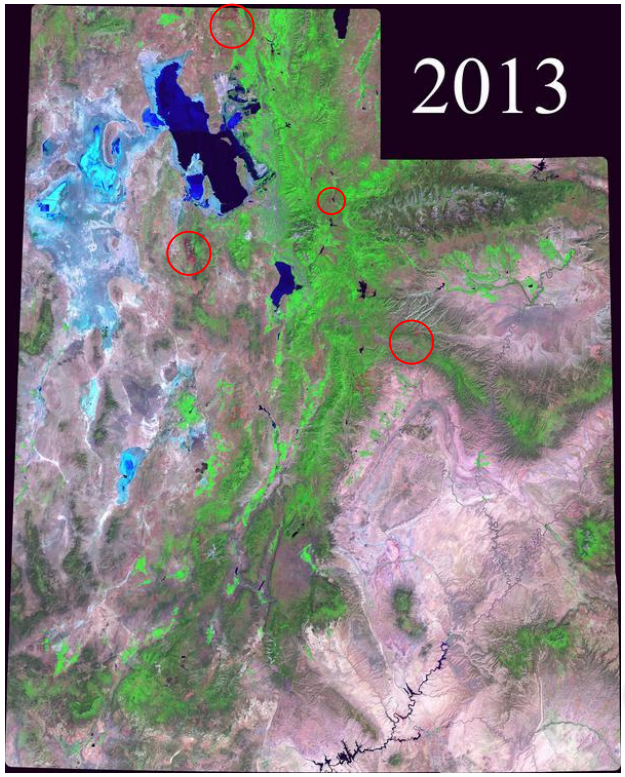


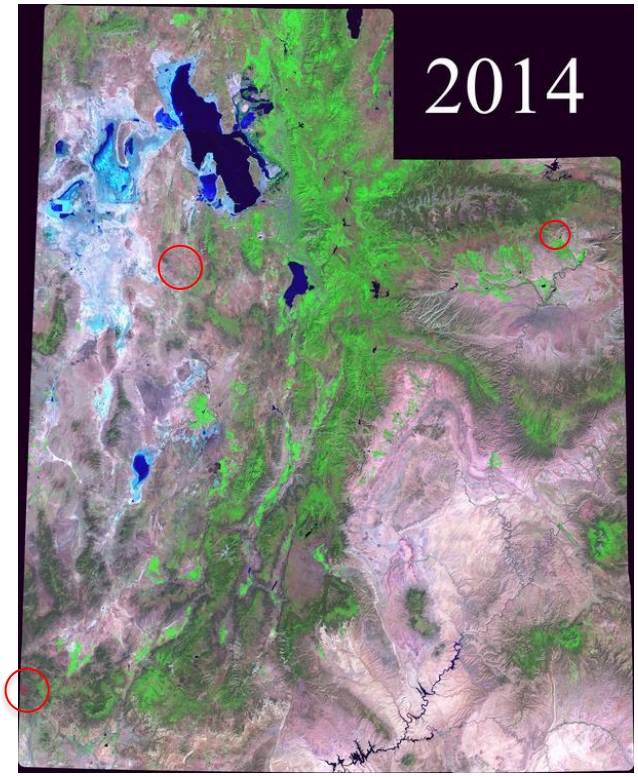
Maximum **NDVI** image mosaics from a multi-temporal stack of OLI imagery converted to surface reflectance (solar angle adjusted)

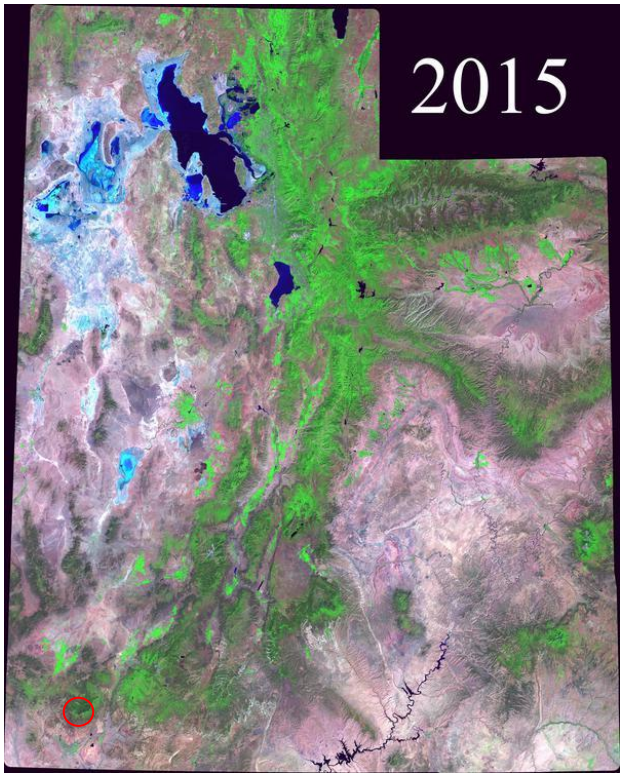
A multi-temporal (summer-long) collection of OLI imagery for 15 different Path/Rows were processed to identify the pixel with the maximum **NDVI** return

The 2013 mosaic consists of 72 individual OLI images
The 2014 mosaic consists of 85 individual OLI images
The 2015 mosaic consists of 89 individual OLI images

Landsat OLI Multi-Temporal Normalized Difference Fire Index Image Mosaics







Maximum **NDFI** image mosaics from a multi-temporal stack of OLI imagery converted to surface reflectance (solar angle adjusted)

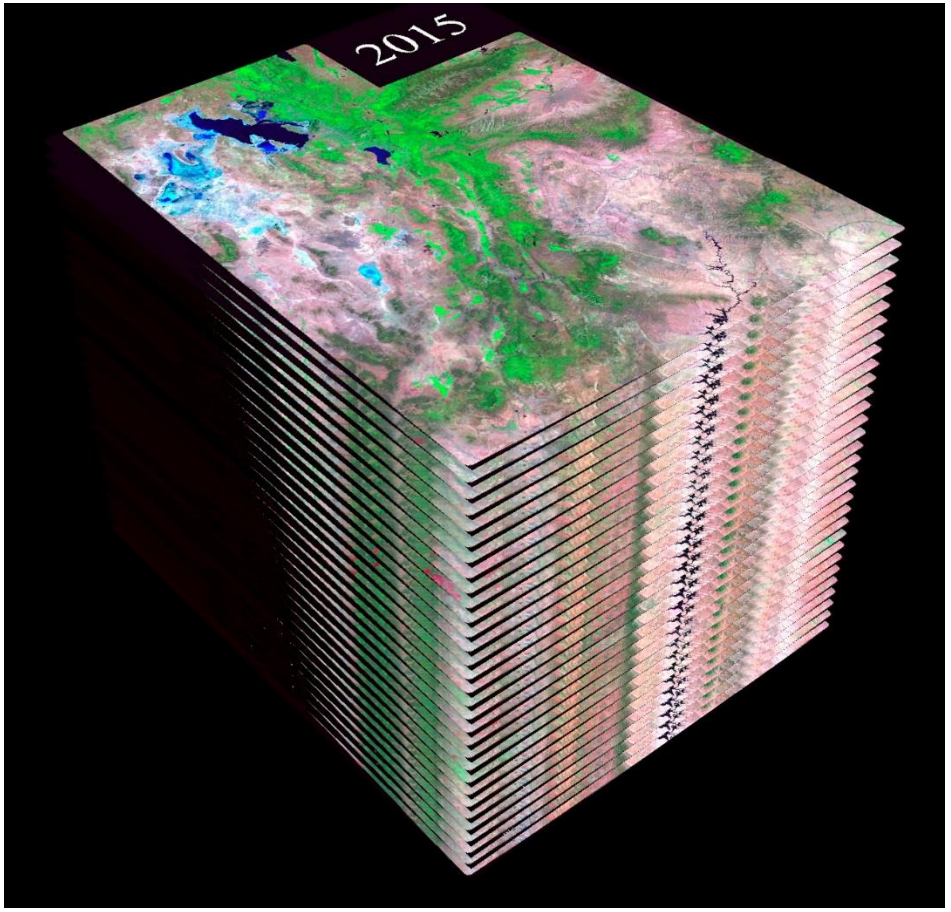
A multi-temporal (summer-long) collection of OLI imagery for 15 different Path/Rows were processed to identify the pixel with the maximum **NDFI** return

The 2013 mosaic consists of 72 individual OLI images
The 2014 mosaic consists of 85 individual OLI images
The 2015 mosaic consists of 89 individual OLI images

○ = fire

High Temporal Density, Large Area Image Mosaics

The process to extract and generate maximum NDVI and NDFI mosaics for Utah was applied to Landsat 5 and 8 imagery spanning 1985-2015. This process allowed us to identify yearly wildfire events and generate fire frequency maps.



Algorithm 2:
Removal of thin clouds in Landsat-8 OLI data with independent component analysis

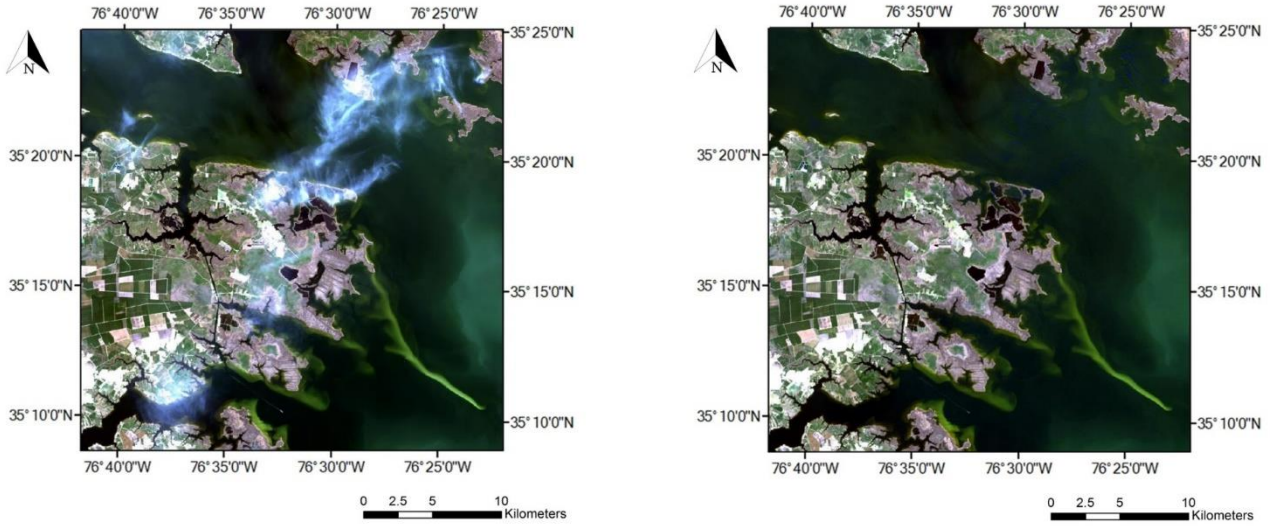
- Pro: removal of thin clouds in visible, NIR, and short IR bands (e.g., Bands 1-7 of Landsat 8) using a single image. No QA band is required.

- Con: Band 9 (of Landsat-8) is required.

Yang Shen, Yong Wang, Haitao Lv, and Jiang Qian, 2015. Removal of thin clouds in Landsat-8 OLI data with independent component analysis. *Remote Sensing*. 7, 11481-11500. http://dx.doi.org/10.3390/rs70911481.

Landsat-8 images

A sub-image of Landsat 8 acquired on 1 April 2014 is shown as a color composite (Band 4 as red, Band 3 as green, and Band 2 as blue). The image is 1000 rows (30km) by 1000 columns (30km). Thin clouds as bright features are noticeable. The area is around Hobucken, North Carolina.



Before and after clouds removed